his

```
SS 1:   RECONSTRUCT: (F) REDUNDAN: (F) ACCESS:   (9)
SS 2:   RECONSTRUCT: (F) ACCESS:   (267)
SS 3:   RECONSTRUCT: OR (  RE (1N) CONSTRUCT:  )  (8545)
SS 4:   (  (  TIME (5N) ZONE#  ) OR (  TIME (5N) SLOT#  )  )   (9720)
SS 5:   3 (F) 4   (33)
SS 6:   1 OR 2   (267)
SS 7:   5 AND NOT 6   (27)

SS 8?
```

---Logging off of Orbit---

□

08/895,886

?
□logoff y

SESSION FINISHED 02/15/99 10:57 A.M.   (CENTRAL TIME)
ELAPSED TIME ON WPAT: 0.71 HRS.
ELAPSED TIME THIS SESSION: 0.72 HRS.
ORBIT SEARCH SESSION COMPLETED.   THANKS FOR USING ORBIT!

08/534,841 → 5,889,938 (not available yet).
07/859,850 → 5,495,572

-4-   (WPAT)
TI - Data reconstruction method after failure for access or read-write in
        parallel with independent storage units - detects failure using error
        check, discriminates failure selects processing for failure from normal
        access or read-write
PN - US5495572 A 96.02.27 *
AB - US5495572 A
        The storage data reconstruction system includes storage units for
storing
        divided data units for storing ECC data corresponding to the divided
        data. A spare storage unit for storing reconstructed data. An
        I-O-reconstruction control circuit, a timer, a data reconstructing table
        for a storage unit which has failed and a circuit for reconstructing
        faulty data are provided.
            When a failure occurs in any of the storage units, the failure is
        detected by an error check, a state of the failure is discriminated, a
        preferred processing suitable for the state of the failure is selected
        from a processing of a normal access or read-write, and a data
        reconstruction processing, and the selected processing is carried out,
or
        the frequency of the processing of the normal access or read-write and
        the data reconstruction processing, or the ratio of the amount of the
        data reconstruction processing within a unit time, is set. The time
taken
        to reconstruct the faulty data does not exceed a fixed period of time.
            ADVANTAGE - Minimises reduction of processing of normal access or
        read-write in failure, limits time required for repair of failure within
        fixed time and ensures high reliability, w.r.t. memory which has
        redundancy for failure of two or more storage. (Dwg.2/9)

3-   (WPAT)
TI - On-line reconstruction method for failed disks in redundant array -
      reconstructing blocks on-the-fly including concurrent reads and read
      elements of concurrent read-modify-write requests
PN - EP-831400 A2 98.03.25 *
AB - EP-831400 A
      The computer system has a redundant disk array using a format that
stores
      blocks and error correcting blocks on different disks. When one of the
      disks fails, it is replaced, manually or automatically by another
      disk. This disk then has to be reconstructed to hold the original data.
          When the disk is available, a sequential process is started to
read
      blocks from other disks and recreate the block for the new disk. During
      this process, reads and writes may be received from elsewhere in the
      system. All reads are processed by a concurrent task that reconstructs
      on-the-fly. This includes the read part of a read-modify-write access.
          ADVANTAGE - Provides logically simple procedure for reconstructing
      disk while retaining concurrent system operation.   (Dwg.3/5)

-44-   (WPAT)
TI - Method of detecting and correcting errors in mass storage system -
      involves reconstructing corrected data slice from one data strip and one
      parity slice, corrected data slice replaces one erroneous data slice
PN - US5649093 A   97.07.15 *
AB - US5649093 A
      The method involves retrieving one the data strip from sad cluster of
      data drives. a data drive failure affecting an erroneous one of aid data
      slices of the one data strip is detected. One of the parity slices
      corresponding to the one data strip is retrieved from the parity drive.
A
      corrected data slice is reconstructed from the one data strip and the
one
      parity slice.
          The corrected data slice replaces the one erroneous data slice.
The
      data slices of the one data strip have been distributed among different
      zones of the data drives so that the average retrieval rate of the data
      slices approximates the access rate associated with intermediate, zone
of
      the data drives.
          ADVANTAGE - Capable of delivering time critical data and real time
      reconstruction of erroneous data without need to substantial increase in
      process

TI - Data word recovery method for digital data system - applies
      reconstruction function to copies of encoded data word to produce
      reconstructed encoded data word.
PN - WO9318589   A1 93.09.16 *
PN - GB2271451   A 94.04.13
PN - DE4391075   T 94.04.28
PN - US5321703   A 94.06.14
PN - GB2271451   B 96.02.14
AB - WO9318589 A
      The method involves encoding the data word according to an
      error-correcting code to produce an encoded data word. A number of
      possibly error-corrupted copies (20) of the encoded data word are
      generated.
          A reconstruction function is applied to the copies of the encoded
      data word to produce a reconstructed encoded data word (22). The
      reconstructed encoded data word is decoded according to the
      error-correcting code. A commonly-used type of code in data storage
      systems is the class of Reed-Solomon codes, which are special forms of
      'BCH codes'.
          ADVANTAGE - Enhances error correction capability in digital data
      systems and allows recovery of data from a sequence of possibly
      error-corrupted instances or copies of encoded data word created from
the
      data according to error-correction code. Has greater data integrity as
      data may be recovered during final decoding step despite failure to
      decode each tape individually.   (Dwg.2/3)

64-   (WPAT)
TI - Disk replacement method in data storage system - by systematically
      reconstructing data or parity blocks with associated status bits in
first
      state and after each reconstruction setting associated status bit to
      second state
PN - US5522031 A   96.05.28 *
AB - US5522031 A
      The method involves detecting a failed disk in an array. The failed disk
      is removed from the array. A new disk is prepared by setting all status
      bits to a first state. The new disk added to the array. Data or parity
      blocks are systematically reconstructed with associated status bits in
      the first state. After each reconstruction of a data block or parity
      block, the associated status bit are set to a second state.
          The systematic reconstruction is continued until all blocks on the
      new disk have been reconstructed. Requests to access data blocks in the
      new disk are received from a user application. Data are written to the
      accessed data blocks in the new disk and the associated status bits are
      set to the second state.
          ADVANTAGE - Allows on-line restoration of replacement disk to RAID
      array while allowing high performance concurrent application access to
      array.

TI – Dynamic expansion for RAID storage system – has storage increased by as
      little as one unit and rearrangement function that re-organises storage
      while continuing to handle processor requests
PN – EP-654736 A2 95.05.24 *
PN – US5564116 A 96.10.08
PN – US5751937 A 98.05.12
AB – EP-654736 A
      The system includes the facility to expand disc storage by one unit at a
      time. The system has a host processor (1001) connected to an array of
      discs (1021-1024) via a controller (1010). Data is spread across the
      discs according to the RAID level and the number of discs available such
      that data can be reconstructed if one block is lost.
          When a new disc unit (1025) is added, the controller begins a
      re-organising program. This reads data in the old pattern and rewrites
it

      in the new pattern. The boundary of the change is tracked to allow host
      requests to be handled.
          USE/ADVANTAGE – As external storage for computer system. Improved
      data transfer speed, increased storage capacity or increase capacity can
      be performed dynamically without stop of system.   (Dwg.1/6)